

EF Lens Control Catalog



ISSI
INNOVATIVE SCIENTIFIC SOLUTIONS, INC

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EF Lens Control

With ISSI EF lens control systems, controlling the lens doesn't require a specific camera to be connected. The ISSI EF lens controllers allow operation of an EF lens on any camera.

The ISSI EF lens control systems are designed to operate Canon®, Sigma® and Tamron® EF lenses on non-DSLR cameras without a native active EF mount.

Rather than give the camera automatic control of focus and aperture, ISSI EF lens control systems give that control to the operator. Devices feature an optional Ethernet connection for operating over long distances or via a network connection and serial communication. Control of these devices can also be written into existing software for both Windows and Linux via ASCII-based API commands via UDP protocol (TCP/IP).

ISSI's EF lens controllers can be tailored to fit custom applications for control of Canon, Sigma and Tamron lenses.



Why Lens Control?

Using a high-quality lens is a necessity in any vision application. Most machine vision cameras don't have built-in EF lens control. Typically, to use an SLR lens on a non-SLR camera means sacrificing control. With the EF lens control systems, any EF lens can be used on any camera.

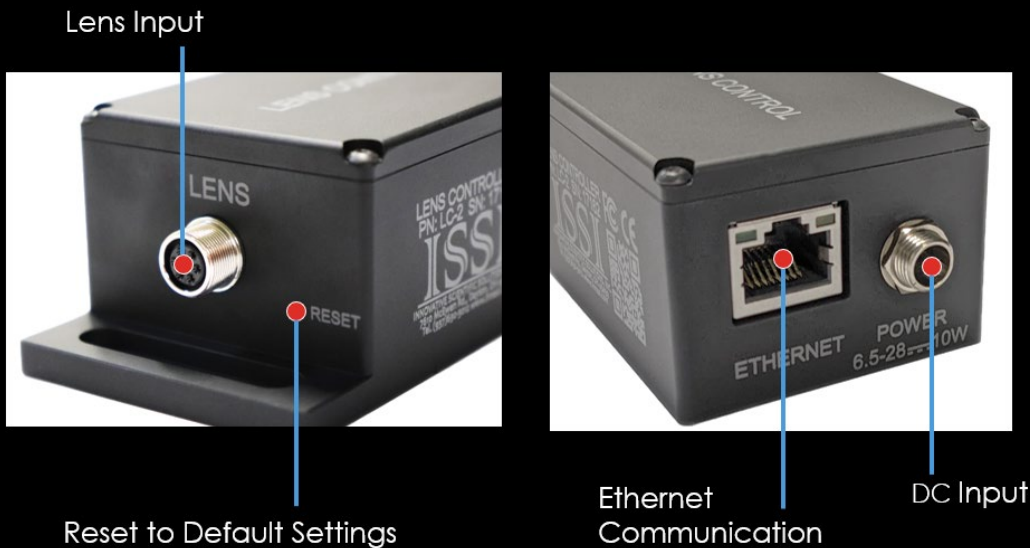
- Remote control of zoom, focus, aperture and image stabilization
- Auto-detection of attached lens and F-number stops
- Unlimited programmable preset capability to easily store and recall saved positions on the lens
- 10/100Mbps Ethernet or serial communication
- Multiple controllers can be connected and simultaneously controlled over a network
- Easy to use software interface and TCP/IP API or ASCII commands for Windows and Linux



Visit our website: <https://innssi.com/lens-control/>

Ethernet EF Lens Control System

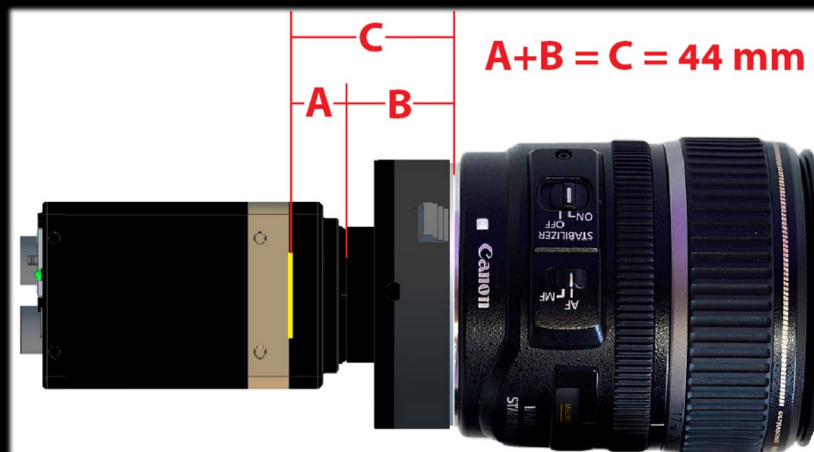
The Ethernet EF Lens Control System features a control box (LC-2) and lens adapter (LC-2A-XXX) to connect to and remotely operate an EF lens. The control box mounts to a camera using a slotted bracket or adapter. The control box features screw and lock connections for lens adapter and power and an Ethernet connection for communication. Its small size allows it to be mounted directly to a camera or within an enclosure. The control box is compatible with all LC-2A-XXX lens adapters.



Lens Adapters

In order to work with a lens directly, a lens adapter is needed to pass communication to the control box. ISSI supplies a variety of lens adapters for the most common camera mounts.

For infinity focus with EF lenses, a flange focal distance of 44.0 mm must be maintained. Flange focal distance is the distance from the lens mounting flange to the sensor image plane. 2D CAD drawings show the optical thickness of each adapter ("B"). Camera datasheets will specify the back focal distance (A) in their mechanical drawings.



Lens Adapter Models

Standard lens mounts are available for the adapters. For cameras with non-standard mounts, customization of the lens adapter is available at an added cost. If the flange focal distance does not equal 44.0 mm with the lens adapter and camera, a separate adapter will be needed or a custom lens adapter will need to be constructed.



EF-c Lens Adapter (LC-2A-C)

A popular mount for lower resolution image sensors, the c-mount is a 25 mm threaded optics mount. The front side of the adapter features an EF adapter ring to lock the lens in place and pins to make contact with the pads on the lens. The back side is a male c-mount threaded screw mount which threads directly into a camera lens mount.



EF-M42x1 Lens Adapter (LC-2A-M42)

A popular mount for medium to high resolution image sensors, the M42-mount is a 42 mm threaded optics mount. The front side of the adapter features an EF adapter ring to lock the lens in place and pins to make contact with the pads on the lens. The back side is a male M42x1.0 metric threaded screw mount which threads directly into a camera lens mount.



EF-M42x0.75 Lens Adapter (LC-2A-T)

The "T" mount is a common lens mount for astronomy cameras and other optical assemblies. The front side of the adapter features an EF adapter ring to lock the lens in place and pins to make contact with the pads on the lens. The back side is a male M42x0.75 metric threaded screw mount which threads directly into a camera lens mount. Also available in short 18mm thickness (LC-2A-T18).



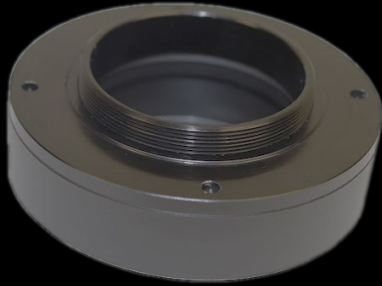
EF-M58x0.75 Lens Adapter (LC-2A-M58-75)

The M58 adapter is used on cameras with large format, high-resolution imaging sensors. The front side of the adapter features an EF adapter ring to lock the lens in place and pins to make contact with the pads on the lens. The back side is a male M58x0.75 metric threaded screw mount which threads directly into a camera lens mount.



EF-M42x0.75 Lens Adapter (LC-2A-T18)

The "T" mount is a common lens mount for astronomy cameras and other optical assemblies. This thinner T-mount adapter is 18mm thick, used for applications involving filter wheels in front of the image sensor. The front side of the adapter features an EF adapter ring to lock the lens in place and pins to make contact with the pads on the lens. The back side is a male M42x0.75 metric threaded screw mount which threads directly into a camera lens mount.



EF-M42x0.75 Lens Adapter (LC-2A-WX)

Made specifically to fit Photron mini-series fast cameras. The front side of the adapter features an EF adapter ring to lock the lens in place and pins to make contact with the pads on the lens. The back side is a male M42x0.75 metric threaded screw mount which threads directly into a camera lens mount.



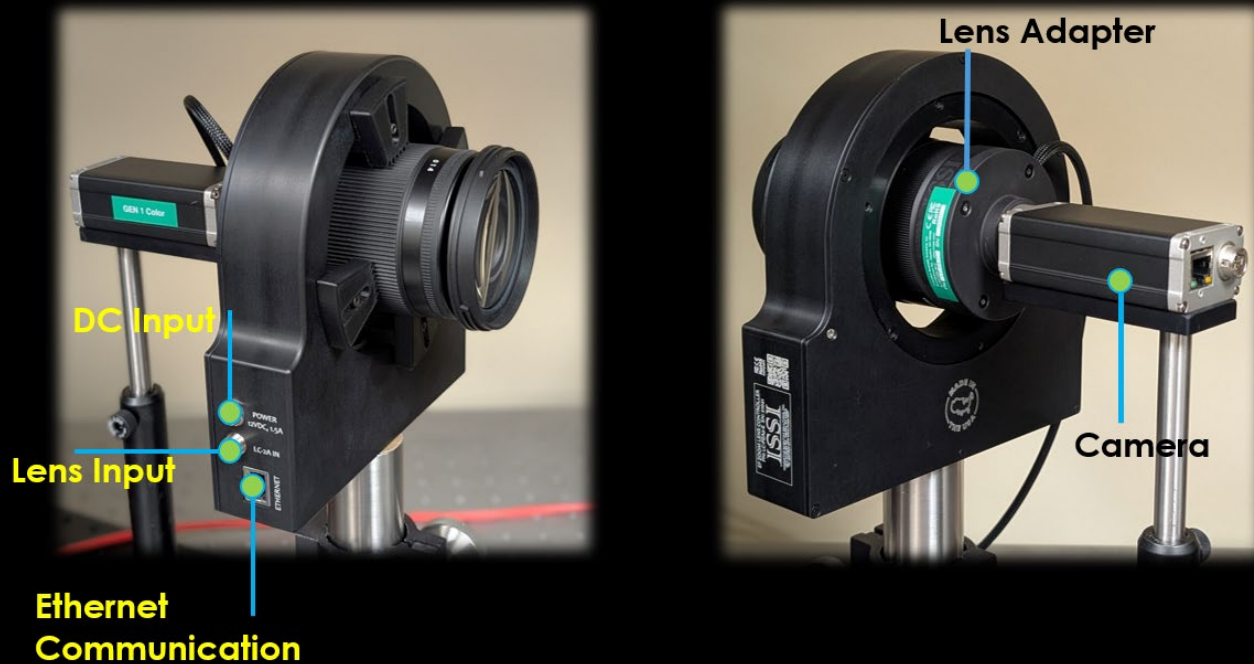
If one of our standard solutions is not compatible with your camera or setup, we can customize a solution that will work. Our full machine shop and electronics lab can tailor a solution to meet your needs.

Ordering Information

Model No.	Camera Interface	Optical Thickness (mm)	Camera Back Focal Distance (mm)
LC-2A-C	C-mount	26.47	17.53
LC-2A-M42	M42x1.0	32.00	12.00
LC-2A-T	M42x0.75	26.50	17.50
LC-2A-T18	M42x0.75	18.00	26.00
LC-2A-WX	M42x0.75	29.40	14.60
LC-2A-M58-75	M58x0.75	32.00	12.00

EF Zoom Lens Control System

The Ethernet EF Zoom Lens Control System is used to operate all features of an EF zoom lens. The control system features a zoom control housing (LC-PZA2) and lens adapter (LC-2A-XXX) to connect to and remotely operate an EF lens. The zoom control housing contains a stepper motor and control system to read and operate the zoom, focus and aperture of an EF zoom lens. A lens grip externally holds the zoom ring of the lens so the controller can change zoom position. The control housing mounts with a standard optical mount (1/4"-20 or M6). The control box features screw and lock connections for lens adapter and power and an Ethernet connection for communication. The LC-PZA2 controller is compatible with all LC-2A-XXX lens adapters.



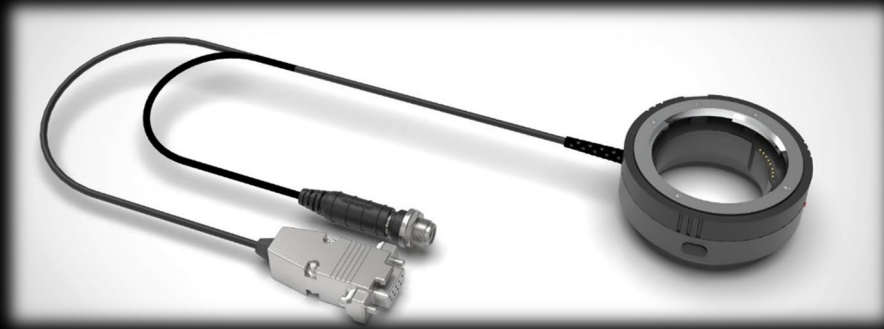
Ordering Information

Model No.	Communication Interface
LC-PZA2-E	TCP/IP Ethernet

The LC-PZA2 can be paired with any LC-2A lens adapter.

Integrated EF Lens Controller

The Integrated EF Lens Controller is a compact version of the EF lens controller used to operate all features of an EF zoom lens. The entire lens control system is built into the adapter housing, eliminating the need for a separate control box. The Integrated EF Lens Controller is designed with system integrators in mind to provide minimal components as well as an industrial RS-232/422/485 serial or I²C communication interface. Commands for the controller can be written into existing software for both Windows and Linux via ASCII-based commands. The controller fits a variety of camera interfaces and can also be customized to fit a specific camera body.



Ordering Information

Model No.	Comm. Interface	Camera Interface	Optical Thickness (mm)	Camera Back Focal Distance (mm)
LCI-EF-232-C	RS-232 Serial	C-mount	26.47	17.53
LCI-EF-232-M42	RS-232 Serial	M42x1.0	32.00	12.00
LCI-EF-232-T	RS-232 Serial	M42x0.75	26.50	17.50
LCI-EF-232-WX	RS-232 Serial	M42x0.75	29.40	14.60
LCI-EF-232-M58-75	RS-232 Serial	M58x0.75	32.00	12.00
LCI-EF-422-C	RS-422 Serial	C-mount	26.47	17.53
LCI-EF-422-M42	RS-422 Serial	M42x1.0	32.00	12.00
LCI-EF-422-T	RS-422 Serial	M42x0.75	26.50	17.50
LCI-EF-422-WX	RS-422 Serial	M42x0.75	29.40	14.60
LCI-EF-422-M58-75	RS-422 Serial	M58x0.75	32.00	12.00
LCI-EF-485-C	RS-485 Serial	C-mount	26.47	17.53
LCI-EF-485-M42	RS-485 Serial	M42x1.0	32.00	12.00
LCI-EF-485-T	RS-485 Serial	M42x0.75	26.50	17.50
LCI-EF-485-WX	RS-485 Serial	M42x0.75	29.40	14.60
LCI-EF-485-M58-75	RS-485 Serial	M58x0.75	32.00	12.00
LCI-EF-I2C-C	I ² C Serial	C-mount	26.47	17.53
LCI-EF-I2C-M42	I ² C Serial	M42x1.0	32.00	12.00
LCI-EF-I2C-T	I ² C Serial	M42x0.75	26.50	17.50
LCI-EF-I2C-WX	I ² C Serial	M42x0.75	29.40	14.60
LCI-EF-I2C-M58-75	I ² C Serial	M58x0.75	32.00	12.00

Compatibility

In addition to the Canon® EF/EF-S product line, ISSI EF Lens controllers are also compatible with most Sigma® and Tamron® EF lenses. This includes full frame and APS-C lens models but does not include all older models with STM motors which are discontinued. The list of tested lenses is kept updated on the ISSI website <https://innssi.com/canon/>.



Precision Motors

The lens controller is recommended for use with precision EF lenses. Each manufacturer has their own name for the internal lens motors.

- Canon: USM (Ultra Sonic Motor)
- Sigma: HSM (Hyper Sonic Motor)
- Tamron: USD (Ultrasonic Silent Drive)

These lenses offer the best focus motor quality with fast, quiet and ultra-precise encoders.

Image Stabilization

Shaking causes frame to frame jitter and image blurring. Lens based image stabilization uses floating elements with electromagnets in the lens which move independent of the lens body to reduce blurring caused by unwanted shaking of the lens. For situations where longer exposures are needed or in low-light, image stabilization is advantageous.

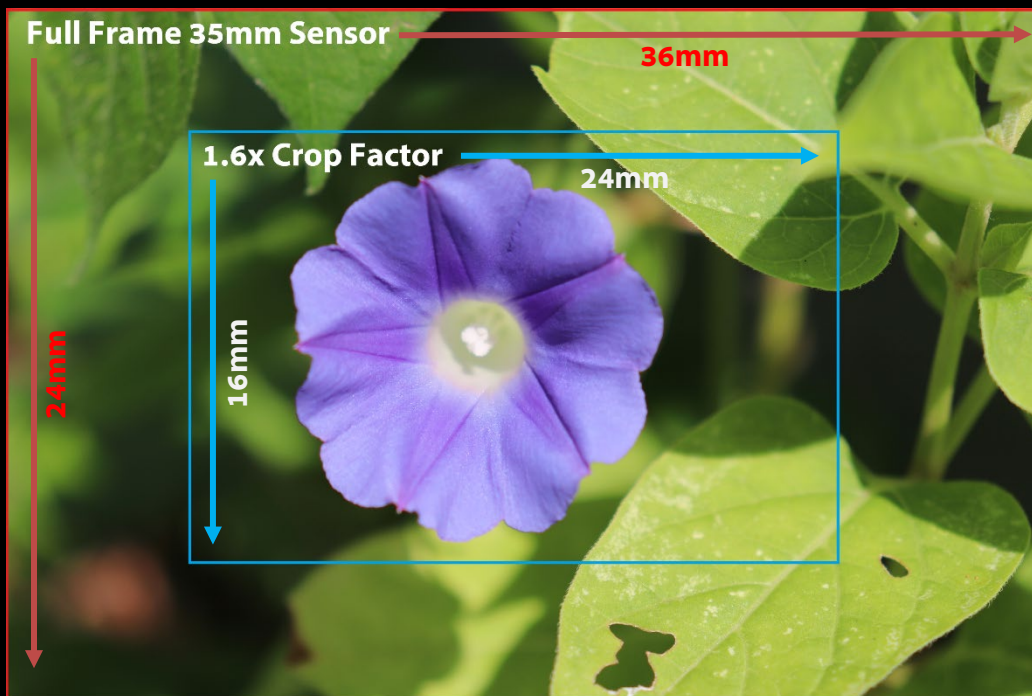
- Canon: IS (Image Stabilization)
- Sigma: OS (Optical Stabilization)
- Tamron: VC (Vibration Compensation)



Image stabilization can be controlled via the lens controller as a simple ON/OFF feature.

Camera and Lens Selector

The application will determine the type of camera and size of the sensor that will be needed. The lenses used with the ISSI EF lens controller are designed for digital single-lens reflex cameras (DSLR) used in general and professional photography. There are two common sensor formats for EF cameras: APS-C or Full Frame. Full Frame sensors are equivalent in size to 35mm film (36mm x 24mm) and are typically found in higher-end DSLR cameras. APS-C sensors are cropped to reduce the cost and size of camera bodies. These sensors are cropped from a standard Full Frame format to a 24mm x 16mm (Canon) format.



Sensor Size Diagram for Full Frame vs. APS-C

Third-party cameras used with the lens controller have sensors of varying sizes so selecting the right adapter and lens for your application is critical to image quality in terms of sensor cropping and lens distortions. The APS-C and Full Format sizes can be used as a guide to compare to your camera sensor size when selecting a lens and lens adapter.

APS-C Format Lenses

- Canon: EF-S
- Sigma: DC
- Tamron: Di-II

Full Frame Lenses

- Canon: EF
- Sigma: DG
- Tamron: Di

Full frame lenses are generally more expensive than those designed for APS-C sensors will provide full use of the larger, full frame size image sensors without lens distortions.

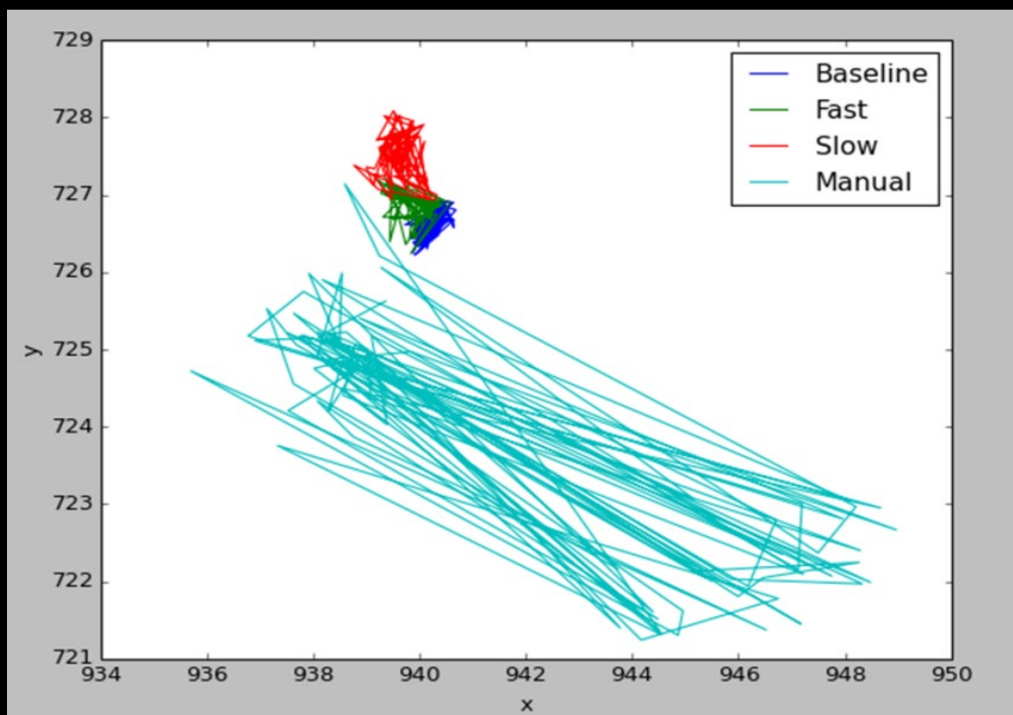
Lens Adapter Selector

Each camera will have its own lens mount or may have a few options for type of lens mount. ISSI lens adapters include most of the common lens mounts available on machine vision CCD and CMOS cameras. The size of the image sensor will determine which lens mount should be used. A lens mount should be selected as to avoid lens distortion or sensor cropping.

Lens Adapter Mount	Maximum Sensor Size Format
C	4/3"
M42x1.0	Full Frame
M42x0.75 (T)	Full Frame
M58x0.75	Full Frame

Repeatability

The precision of the lens encoder is a big part of the repeatability of the motor positions on the lens. Higher quality lenses will have more precise encoders, allowing better focus repeatability. Repeatability of focus position is very important in vision applications. Removing the human element from focusing dramatically increases the repeatability. The LC-2 can deliver better than 98% focus accuracy for most EF lenses.



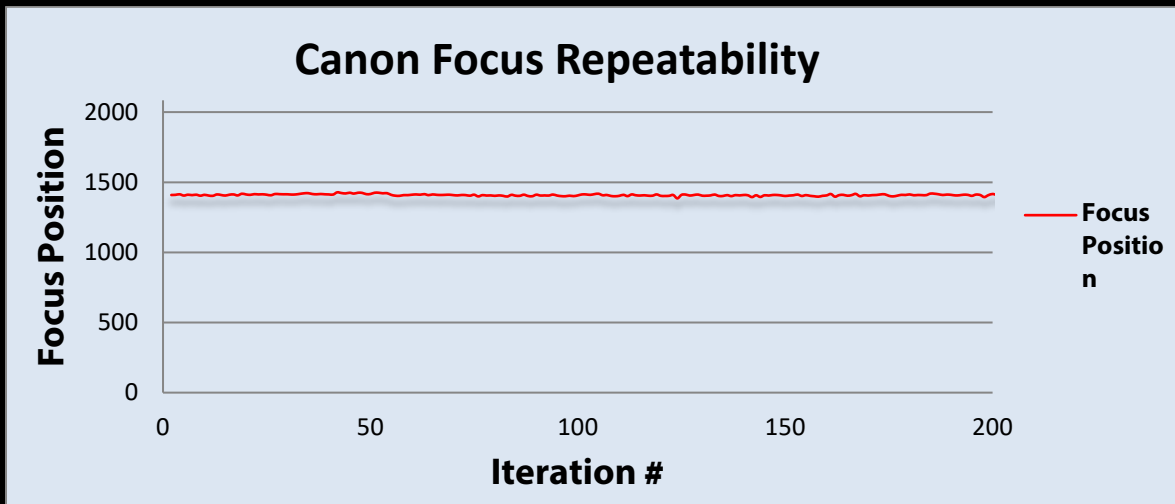
Lenses experience drift in the focus motor position. This causes the encoder position associated with a particular focus point to change. This is not an effect of the controller, but the lens encoder itself.

Sample Lens Performance Data

Canon EF 400mm f/5.6L USM Lens

Focus lens. Save focus position. Reboot LC-2 and recall saved focus position. Focus position vs. iteration is displayed.

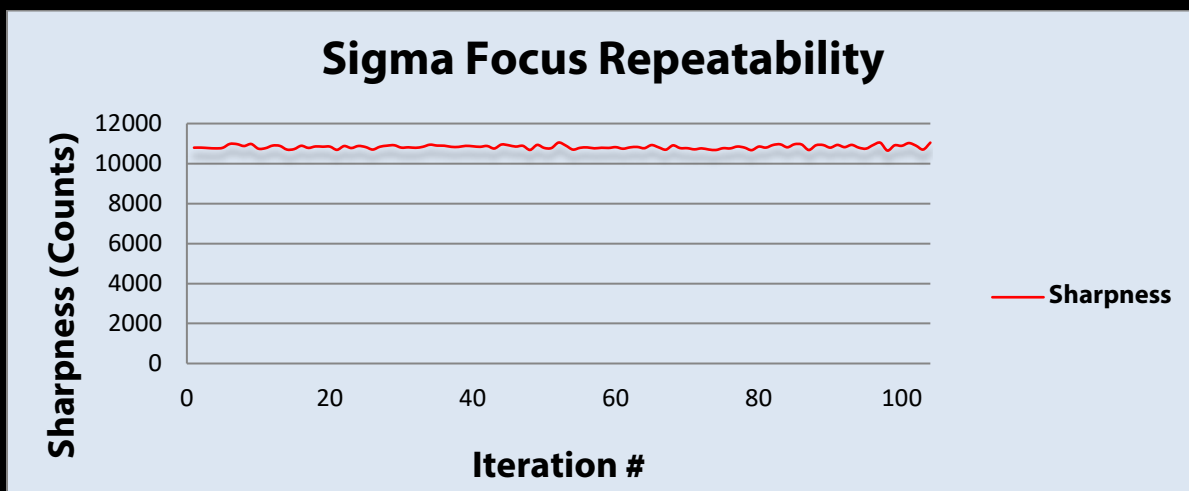
- Standard Deviation: 0.71%
- Accuracy: 99.96%



Sigma 150-600mm f/5-6.3 DG OS HSM Lens

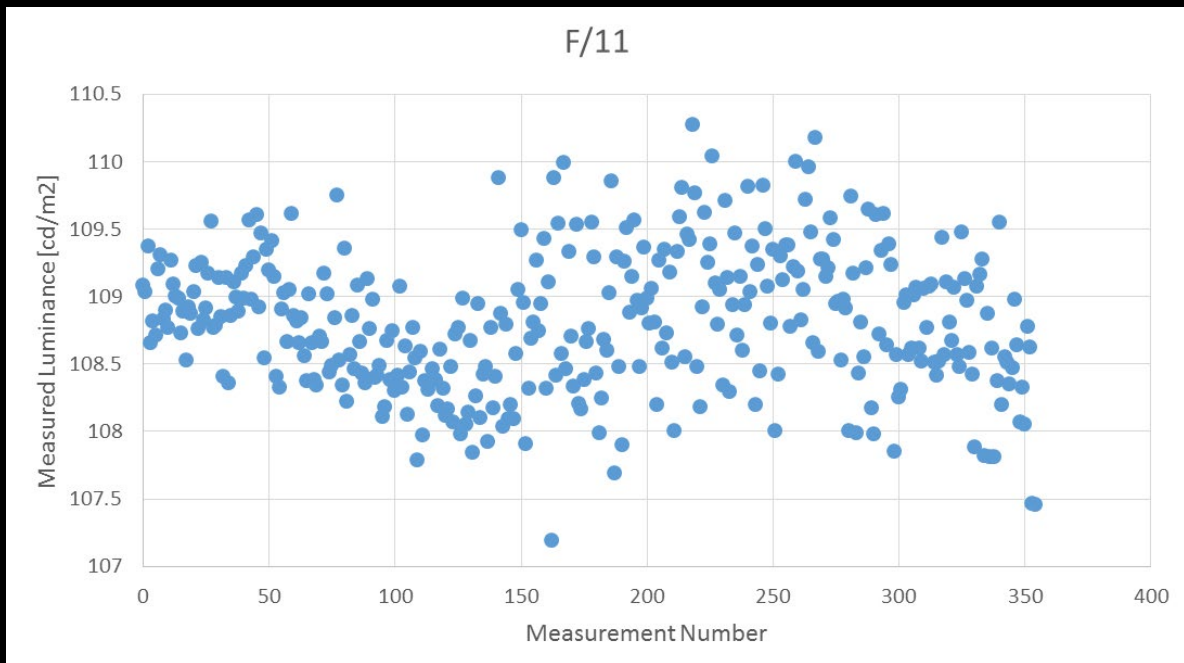
Focus lens. Save focus position. Reboot LC-2 and recall saved focus position. Image sharpness vs. iteration is displayed.

- Standard Deviation: 0.83%
- Accuracy: 99.17%



Aperture Repeatability

Aperture positions are determined from the lens and f/stops calculated in the software.



Aperture accuracy is better than 98%.

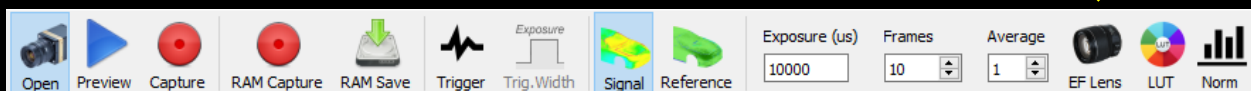
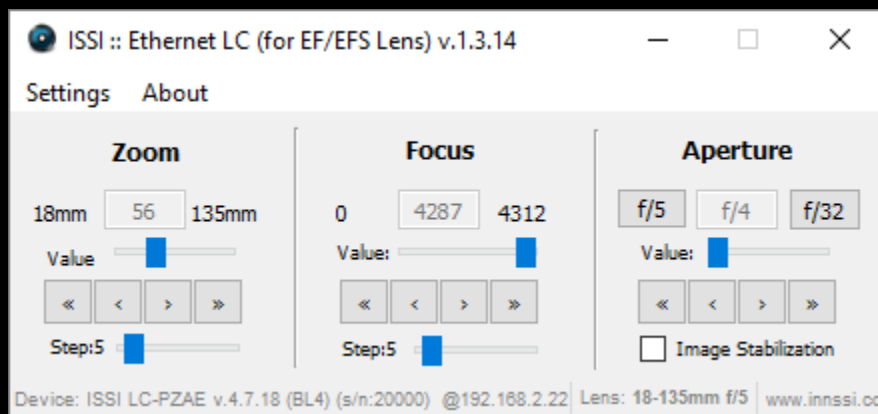
Note: Accuracy and repeatability of preset positioning for zoom, focus and aperture and lens dependent.

Integration

ISSI EF lens control systems are designed to be integrated into existing vision system setups. The ease of installation and software integration makes building with EF lens controllers efficient.



Available with the lens controller are ASCII-based API commands via UDP protocol (TCP/IP) for Windows and Linux. The API commands are based on UDP protocol and the 1339/UDP port is used for communication. These allow the lens controller to be integrated into existing software for existing imaging systems. For integrators of the controller, this is the preferred method of control and communication with the controller where it serves as a component in a larger system.



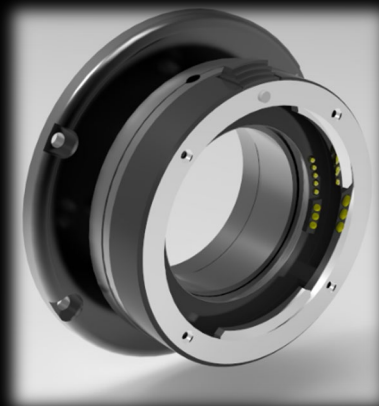
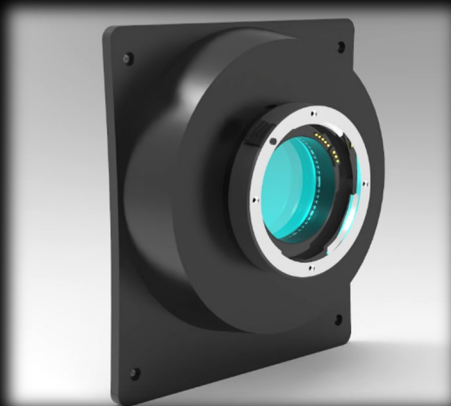
Custom and OEM Solutions

Need your own branded controller? Custom and OEM solutions are available upon request. Let ISSI know your requirements and we can design a custom solution to meet your needs with your company branding. Our on-site machine shop and design team are ready to assist you to put together a custom solution to meet your needs.



Lens adapters can be made to fit most camera models if one of the standard versions will not fit. Flange focal distance must be maintained at 44.0 mm for EF lenses to focus to infinity. We work with camera manufacturers to provide custom solutions that can be seamlessly integrated and don't void the camera warranty.

Looking for a complete packaged vision system? We can work to match your imaging system specifications to a camera and lens combination compatible with the lens controller via our network of camera suppliers.



Lens Control or No Lens Control?

Does your application really need to incorporate remote lens control? In some cases, it may not and that's okay, we're still happy to answer any questions. For applications where there is no physical access to the lens during process operation, lens control can save your engineering and maintenance team quite a bit of valuable time. When your vision system is operating, shutting down to adjust an out of focus camera manually could put a strain on your manufacturing pipeline. Using a remotely operated lens controller to quickly adjust focus or aperture will keep the pipeline moving while simultaneously making the adjustment. When setting up new systems, rather than spend dedicated time with each image system after it's mounted in place to manually adjust the lens parameters, why not set it and forget it and adjust your lens settings from your control area with the click of a button? Need to adjust focus based on object distance from the lens? Preset focus/aperture positions can be saved during system setup and recalled with the click of a button or automatically based on feedback to the lens control system. Take the hassle and stress of setup and adjustment out of your vision system while using a high-quality photography lens and keep your pipeline moving.

